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Halo monitor for high-intensity hadron beams based on supersonic gas curtain

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Although there is no clear definition of beam halo in particle accelerators, it is generally regarded as particles outside of the beam core with an intensity level of less than 10^{-5} or 10^{-6} of the peaks. In high-intensity, high-power hadron accelerators, the presence of halo particles may cause emittance growth and beam loss, difficulties in beam control and collimation, increase the noise of detectors, and cause activation or even damage to accelerator components.

To understand the halo dynamics, experimental studies are essential, but the required detection techniques are often too limited and do not meet the required high dynamic range.

In this contribution, a supersonic gas curtain-based profile monitor is considered for beam halo measurement in high-intensity, high-power hadron accelerators. This monitor is based on the beam gas curtain (BGC) monitor, successfully used in the Large Hadron Collider. Instead of a broad curtain with uniform density, a new concept with two shorter curtain segments which can be adapted to the shape of the beam core and aim at the halo particles only is applied. The monitor design and operating principle will be presented, and the anticipated integration time, signal intensity and dynamic range will be discussed, as well as opportunities for increasing the sensitivity by incorporating micro-channel plates or the Timepix detector.

Footnotes

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Yes

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